ABSTRACT OF THE DISCLOSURE

This invention relates a laser vibrometer. A frequency modulated laser source (2, 3) generates a frequency modulated output, preferably a linear ramp, which is used for both the transmit beam and the local oscillator signal. Transmit (26) and receive optics (27) transmit the transmit beam towards a target and receive radiation returned therefrom. The local oscillator is mixed with the received beam and the mixed signal detected by a detector array (28). Before mixing with the received radiation however the local oscillator is delayed for a time substantially the same as the flight time of the radiation, preferably through a variable optical delay (32). Delaying the local oscillator signal in this way means that the received radiation was generated at nearly the same time as the local oscillator signal with which it was mixed and both received the same modulation. Therefore any variations in modulation of the modulation of the source will be present in both the receive beam and local oscillator signal and will to a large extent cancel. The use of a delay also means that the detected intermediate frequency has a narrow bandwidth easing signal processing requirements and also as the local oscillator signal is in near coincidence with the received beam the effects of phase noise of the source are reduced.

The detected signal therefore has an intermediate component representative of residual range and bulk Doppler effects and an AC component which contains the microDoppler frequencies indicative of any vibrations of the target.

The present invention therefore provides a 3D imaging vibrometer